

| | | | | | | | |
|---|--|-------------------|--|---|--|---|--|
| AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT | | | | 1. CONTRACT ID CODE | | PAGE OF PAGES | |
| 2. AMENDMENT/MODIFICATION NO. | | 3. EFFECTIVE DATE | | 4. REQUISITION/PURCHASE REQ. NO. | | 5. PROJECT NO. (If applicable) | |
| 6. ISSUED BY | | CODE | | 7. ADMINISTERED BY (If other than Item 6) | | CODE | |
| 8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) | | | | (X) | | 9A. AMENDMENT OF SOLICITATION NO. | |
| | | | | | | 9B. DATED (SEE ITEM 11) | |
| | | | | | | 10A. MODIFICATION OF CONTRACT/ORDER NO. | |
| | | | | | | 10B. DATED (SEE ITEM 11) | |
| CODE | | FACILITY CODE | | | | | |

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

- ☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:
- (a) By completing items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment your desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS.
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

| | |
|-----------|---|
| CHECK ONE | A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A. |
| | B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b). |
| | C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: |
| | D. OTHER (Specify type of modification and authority) |

E. IMPORTANT: Contractor ☐ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

| | | | |
|---|------------------|--|------------------|
| 15A. NAME AND TITLE OF SIGNER (Type or print) | | 16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) | |
| 15B. CONTRACTOR/OFFEROR | 15C. DATE SIGNED | 16B. UNITED STATES OF AMERICA | 16C. DATE SIGNED |
| (Signature of person authorized to sign) | | (Signature of Contracting Officer) | |

Item 14. Continued.

CHANGES TO THE SPECIFICATIONS

1. Replacement Sections - Replace the following sections with the accompanying new sections of the same number and title, bearing the notation "ACCOMPANYING AMENDMENT NO. 0001 TO SOLICITATION NO. DACA63-99-B-0065:"

| | |
|-------|-----------------------------------|
| 01001 | GENERAL REQUIREMENTS |
| 01010 | CONTRACT CONSIDERATIONS |
| 01200 | PROJECT MEETINGS |
| 16711 | FIBER OPTIC SYSTEM, OUTSIDE PLANT |

CHANGES TO THE DRAWINGS

2. Replacement Drawings.- Replace the drawing listed below with the attached new drawing of the same number, bearing the notation "AM #0001":

Sequence No.

5 (SHEET L 2 OF 4, LO2_01.cal: TITLE - DETAILS)

END OF AMENDMENT

SECTION 01001

GENERAL REQUIREMENTS

AM #0001

PART 1 GENERAL

1.1 SCOPE

The work covered by these specifications consists in furnishing all plant, labor, equipment, appliances, and materials in performing all operations in connection with the complete, in strict accordance with the contract drawings, these specifications and special conditions which are subject to the terms and conditions of this contract.

PART 2 PRODUCTS

2.1 WORK TO BE DONE: Work to be done is as hereinafter specified:

2.1.1 General Description

There are two schools in the Ft. Stewart School System: Britten Elementary and Diamond Elementary. A third school is in the planning stages and one handhold with an extra interduct for future is provided to expand the network to another school. The work to be performed under base bid of this contract includes the installation of a Community Area Network System (CANS) between each location. Removal of the existing ceilings and lighting necessary for installation of the new system will require incidental work associated with architectural patching and painting.

2.1.2 Coordination of Work

The work shall be completed in accordance with the following key dates. Contractor access hours to work areas shall be as specified herein. The majority of the work exists outside the school buildings and shall be coordinated with the Base Department of Public Works. The coordination with DPW will be the responsibility of the Contractor. For work inside the schools, coordination of the areas available will be the responsibility of the contractor and the school principal subject to the approval of the Contracting Officer. The school shall be notified 3 days prior to the desired commencement of work in any given area to facilitate moving and class organization. The school will conduct moving operations for these areas.

2.1.3 Work Requirements

Supply all material, labor and equipment as required to perform any ancillary work indicated and/or specified.

PART 3 EXECUTION

3.1 SPECIAL CONDITIONS

3.1.1 Environmental Requirements

The contractor is responsible for knowledge of and compliance with all environmental laws, regulations, and programs of this installation, the County, State and Federal agencies that relate to or may arise under the

performance of this contract. Included, but not limited to is compliance with the Fort Stewart, Georgia, Environmental Protection Program by compliance with applicable standards for the prevention, control and abatement of environmental pollution in full cooperation with the Installation, Federal, State, and local Governments.

3.1.1.1 Penalties

Penalty charges resulting from citations against Department of Defense, Department of the Army, or Fort Stewart, Georgia, or its agents, officers, or employees due to the contractor's failure to comply with environmental laws, regulations, and programs, that relate to or may arise under the performance of this contract may be deducted or set-off by the Government from any monies due the contractor, and with respect to such citations, the contractor will further take any corrective or remedial actions as directed by such agencies.

3.1.2 WARRANTY

The contractor shall provide a written warranty to last one (1) full year from the date of acceptance to cover materials and workmanship used in the accomplishment of this contract. Any rework shall be done at no additional cost to the Government. The warranty shall be submitted to the Contracting Officer prior to final acceptance.

3.1.3 PERMITS

3.1.3.1 Excavation

All contractors and their subcontractors shall be required to obtain an excavating permit from the government prior to performing rock or soil excavation. The contracting officer (CO) will discuss the excavating policy at the construction pre-work meeting and will furnish the contractor the required forms. Should the policy not be addressed during the pre-work, the contractor shall still be responsible for obtaining the excavating permit from his CO and for coordinating with all signatory personnel listed on the form. The government reserves the right to assess monetary damages against any contractor for repair of damage to underground utilities when excavations are performed without the referenced permit.

3.1.3.2 Confined Work Space

Contractor shall observe OSHA Regulation 29 CFR Parts 1910 regarding permitting, entry and working within confined spaces. Contractor is required to submit his work plan to the Contracting Officer's representative prior to entering any confined space.

3.1.3.3 Radios

Contractors utilizing mobile/hand radios are required to register their frequency with the Information Technology Business Center.

3.1.4 Conduct & Dress

Workers shall be properly attired at all times. Full-length pants (no shorts), shirts (tee-shirt minimum), and proper shoes (no flip-flops, thongs, or open-toed sandals) are required. No smoking in building. Department of the Army Smoking Policy (AR 1-8) shall be observed. Smoking shall be permitted in designated areas only. Smoking allowed outside as

long as butts, wrappers, packages, etc., are policed daily. The contractor shall ensure that all lunch and breaktime debris are contained, removed from the site at the end of each period and properly disposed of as specified. No item(s) in occupied building is to be used, i.e., telephone, brooms, etc. The contractor shall confine his personnel to the area within which the work is being performed. Bathrooms are not to be used in occupied buildings. Profanity is strictly forbidden. The utmost courtesy shall be extended to building occupants at all times. Conversation with occupants should be limited to and pertain to business at hand. Only necessary company operational vehicles shall be driven to project site. All privately owned vehicles shall be parked at contractor's storage area. Streets and driveways shall be left free at all times.

3.1.5 Storage

All debris, tools, supplies, etc., shall be removed or stored in such a manner as not to interfere with the use of the facility.

3.1.6 Work Hours

[AM #0001] Work at the schools shall be performed during the hours of 3:00 p.m. to 11:00 p.m. Monday thru Friday when school is in session. When school is not in session, all work shall be done during the hours of 7:30 a.m. to 4:00 p.m., Monday thru Friday.

3.1.7 Lock-in/Tag-out for Safety

The Contractor shall use a locking device that secures a valve or lever in the "off" position when a repair, inspection, or construction or new installation is required and also to clean or move any equipment. Making any exception to this rule could result in serious injury and death.

3.1.7.1 Lock-out

Blocking the flow of energy from the power source to the equipment - and keeping it blocked out - is called a lock-out system. A locking device is usually a key or combination lock arrangement.

3.1.7.2 Tag-out

Tag-out means placing a tag on the power source to warn co-workers or others not to turn the power on. The information on the tag shall include the name of personnel who put it there, the date, time the work begins, and type of work to be performed.

3.1.7.3 Basic Rules

Before shut down, the Contractor shall ensure that authorized employees know the type, magnitude, and hazards of the energy to be controlled; and shall verify the method or means of the system. He shall inform all affected employees of the lockout. The equipment shall be turned off, and the Contractor shall lockout energy sources and tag-out at the disconnect point. Any stored or residual energy may be released at that time so the equipment can be tested. The Contractor shall restore energy safely.

3.1.8 ENVIRONMENTAL ISSUES

3.1.8.1 Spill Containment

If hazardous chemicals or POL spills occur at the job site, the contractor will contain the spill with contractor furnished spill kit materials. While the spill is being contained, the Ft. Stewart Fire Department and then the DPW Environmental Division shall be notified immediately. The containing and notification of the spill should happen simultaneously.

3.1.8.2 Inventories

The Emergency Planning and Community Right-To-Know Act (EPCRA) requires that site specific information concerning hazardous chemicals use and releases be provided. The Contractor is required to maintain an inventory of hazardous materials. This inventory will be provided to Department of Public Works (DPW) Environmental Division prior to receipt of final payment.

3.2 SCHEDULE OF WORK

The contractor shall note the following conditions:

3.2.1 Notification

The contractor shall coordinate all his work and scheduling with the Contracting Officer's Representative. The contractor shall notify the Contracting Officer's Representative and the occupant a minimum of seventy-two (72) hours in advance of commencing work.

3.3 SUBMITTALS AND SAMPLES

3.3.1 Submittals

Six (6) copies of all Government Approval (GA) submittals shall be provided for materials indicated on the drawings or specified herein. These copies shall be separated and mailed to the addresses as indicated below:

Four copies: The Contracting Officer; Name and address to be determined at the pre-work conference

One copy for information/record: Directorate of Contracting

One copy for information/record: Parkhill, Smith & Cooper, Inc.; Mike Cartwright, P.E.; 4010 Avenue R.; Lubbock, Texas 79412

3.3.1.1 Substitution

If the contractor chooses items or equipment other than ones referenced on the drawings, he shall submit illustrations, schedules, performance charts, instructions, brochures, diagrams and other information of his "equal" and the ones referenced. These materials will be used for comparison purposes in determining the acceptability of the "equal" unit. The Contracting Officer reserves the right to request samples of "or equal" items when the information submitted for comparison is inadequate in determining acceptability. The contractor is required to obtain approval for all items, regardless of whether identical to the ones referenced in the contract documents or a substituted "equal".

3.3.2 Certification

The contractor shall submit an individual certification from the manufacturer that each and every material component used in this project is 100% asbestos-free.

3.3.3 Color Samples

The contractor shall review the contract specifications and all submittals for sections that require color selections shall be submitted at one time. (i.e. paint, etc.). Color samples submitted separately will not be reviewed until all required samples are received.

3.3.4 O&M Manuals

Contractor shall submit five (5) copies of bound instructions covering operation and maintenance of all major items of equipment prior to acceptance of work. Instructions shall be in hardcover 3-ring binder with contract number, project number, building number, project title and contractor's name, address and telephone number on the binding and the front cover. A table of contents and a list of equipment in place (Form MOB 897 available from Contracting Officer's Representative) shall be submitted within the O & M manual showing:

- Number of each unit
- Item and type
- Size or capacity
- Manufacturer
- Cost or Value

The operation and maintenance manuals shall also contain the following:

- a. Complete list of subcontractors noting item of work, subcontractors name, address, telephone number, and the name of the person to contact.
- b. Color Schedules. Schedules shall include, for each material, manufacturer's name and address, color and color number.
- c. Manufacturer's recommendations for operations and maintenance of all fixtures, equipment, and systems including charts, diagrams, performance curves, catalog data and maintenance manuals.

3.4 AS-BUILTS

The Contractor shall furnish a copy of reproducible marked-up as-built drawings to the Contracting Officer's Representative prior to receipt of final payment. These as-builts shall show any deviations to the drawings, including any modifications/change- orders which were issued by the Government during the Contract.

3.5 Tests

3.5.1 Testing Procedure

The contractor shall perform tests specified or required to verify that control measures are adequate to provide a product which conforms to contract requirements. The contractor shall procure the services of an industry recognized testing laboratory or he may establish an approved testing laboratory at the project site. A list of tests which the contractor understands he is to perform shall be furnished as a part of the CQC plan to the Contracting Officer. The list shall give the test name, specification paragraph containing the test requirements, and the personnel and laboratory responsible for each type of test. The contractor shall perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms, including all of the test documentation requirements, have been prepared.

3.6 Completion Inspection

At the completion of all work or any increment thereof established by a completion time stated in the paragraph entitled COMMENCEMENT, PROSECUTION & COMPLETION OF WORK or stated elsewhere in the specifications, the CQC System Manager shall conduct a completion inspection of the work and develop a punch list of items which do not conform to the approved plans and specifications. Such a list shall be included in the CQC documentation and shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or his staff shall make a second completion inspection to ascertain that all deficiencies have been corrected and so notify the Contracting Officer's Representative. The completion inspection and any deficiency corrections required by this paragraph will be accomplished within the time stated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

3.7 Documentation

3.7.1 Records

The contractor shall maintain current records of quality control operations, activities, and tests performed including the work of suppliers and subcontractors. These records shall be on an acceptable form and indicate a description of trades working on the project, the numbers of personnel working, the weather conditions encountered, any delays encountered, and acknowledgment of deficiencies noted along with the corrective actions taken on current and previous deficiencies. A typical contractor quality control report form is at paragraph 8.9.4. In addition, these records shall include factual evidence that required activities or tests have been performed, including but not limited to the following:

- a. Type and number of control activities and test involved.
- b. Results of control activities or tests.
- c. Nature of defects, causes for rejection and similar actions.
- d. Proposed remedial action.
- e. Corrective actions taken.

3.8 Daily Logs

These records shall cover both conforming and defective or deficient features and shall include a statement that supplies and materials incorporated in the work comply with the contract. Legible copies of these records shall be furnished to the CO daily.

3.9 Notification of Noncompliance

The Contracting Officer will notify the contractor of any noncompliance with the foregoing requirements. The contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the contractor or his representative at the site of the work, shall be deemed sufficient for the purpose of notification. If the contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop work orders shall be made the subject of claim for extension of time or for excess costs or damages by the contractor.

ENVIRONMENT CONTRACT CONCERNS

I. CLEAN AIR ACT

A. TITLE III

1. Hazardous air pollutants must be identified from process.
2. Inventories, controls, permits, changes to Ft. Stewart's permit and sources are concerns.

B. TITLE V

1. Construction and operating permits (added or changed equip.) Boilers, fuel burning equipment, petroleum and storage tanks, open burning, paint booths, hot water heaters, high pressure washers, are typical examples of regulated items.

2. Inventories, controls, permit changes are areas of concern.

3. No equipment is to be constructed or installed prior to receiving the construction permit or modification to the TITLE V Permit.

C. TITLE VI

1. Ozone depleting substances (no class 1's, less than 0.05 odp)
2. Certification, work practices, and recovery equipment, etc

D. SIGNIFICANT LEAD TIME IS INVOLVED IN CLEAN AIR ACT PERMITTING!!!

II. CLEAN WATER ACT

- ###### A. Permits to modify sewer collection system (state approval)

- ###### B. Pretreatment of discharges to sanitary sewer (industrial)

- ###### C. Permits to tie onto the sewer system through PWBC O&M

- ###### D. No floor drains allowed

- ###### E. ABOVE GROUND STORAGE TANKS

1. Secondary containment design

2. Tank bottom water treatment/management

3. Air permits required?

- ###### F. STORM WATER

1. CONSTRUCTION SITE STORMWATER

- a) Site specific plan meeting regulatory requirements

- b) Notice of intent filed w/ state

- c) Implement and maintain the practices throughout the entire life of the construction project

2. INDUSTRIAL ACTIVITIES

- a) Site Specific Plan IAW Ft. Stewart's SWPPP

- b) Basic and advance best management practices to meet discharge requirements

- ###### G. SINKHOLES (CONSTRUCTION SITES AND SUBSEQUENT OPERATIONS)

1. TN CLASS V INJECTION WELL RULES

- a) Permits, discharge, closure for construction

- b) Site specific plan to control runoff quality during and after construction

III. EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT (EPCRA)

EPCRA requires that site specific information concerning hazardous chemicals use and releases be provided. The contractors will be required to maintain an inventory of hazardous materials. This inventory will be provided to PWBC Environmental Division to be added as an appendix to the Ft. Stewart Spill Response Plan. An additional requirement that is being mandated by EPCRA is that inventories of hazardous substances listed in the ACT include quantities received, amount used, and quantities turned in for disposal. The amount that is not accounted for will be considered as quantities that were released to the environment. Based on this new requirement it is imperative that strict inventory controls be placed on hazardous substances that are being used on Ft. Stewart.

IV. FEDERAL INSECTICIDE FUNGICIDE RODENTICIDE ACT (FIFRA)
-- End of Section --

SECTION 01010

CONTRACT CONSIDERATION

AM #0001

PART 1 GENERAL

1.1 CONTRACTOR ACCESS AND USE OF THE PREMISES

1.1.1 Commencement of Work

The Contractor should duly note that commencement of work as indicated in section 01000 CONSTRUCTION SCHEDULE does not necessarily indicate that the facility will be available for normal construction operations. Reference the remainder of these specifications for phasing, and availability of work criteria.

1.1.2 Station and Activity Regulations

Ensure that Contractor personnel employed on the Station become familiar with and obey Station and Activity regulations. Keep within the limits of the work areas and avenues of ingress and egress. Do not enter restricted areas unless required to do so and until cleared for such entry. The Contractor's equipment shall be clearly marked for identification.

1.1.3 Working Hours

1.1.3.1 Access Allowed

[AM #0001] In facilities where Contractor will be permitted access to selected area inside the occupied facility, regular working hours shall consist of an 8.5 hour period between 7:30 and 4:00 pm, Monday through Friday, excluding Government holidays unless otherwise specified herein.

1.1.3.2 No Access Allowed

In facilities where Contractor will not be allowed access inside the occupied facility, regular working hours shall consist of an 8.0 hour period between 3:00 and 11:00 pm, Monday through Friday, excluding Government holidays unless otherwise specified herein.

1.1.4 Work Outside Regular Hours

Work performed during hours outside of regular hours is subject to Contracting Officer approval. Contractor shall make application 7 calendar days prior to such work to facilitate arrangements to be made by the Government for inspecting work in progress. Application shall give the specific dates, hours, locations, type of work to be performed, contract number and project title.

1.1.5 Utility Cutovers

Contractor shall make effort to exact any required utility cutovers outside of regular working hours to minimize any impact in occupied facilities.

1.2 SPECIAL REQUIREMENTS FOR OCCUPIED BUILDINGS

The work under this contract requires special attention to the scheduling

and conduct of the work in connection with existing building operations.

1.2.1 Interruptions

Contractor shall identify on the construction schedule any activity or factor with potential to create interruption to the normal operation of the building.

1.2.2 Life Safety and Egress

During any time the building is occupied, all code requirements for life safety and building egress/evacuation must be maintained.

1.2.3 Security

The existing buildings and their contents must be kept secure at all times.

Contractor will provide and install temporary closures as required to maintain physical security of the building and contents as directed by the Contracting Officer.

1.2.4 Noise

The Contractor shall be aware of and recognize the fact that when he is working in occupied building facilities, he should apply conscientious effort to minimize noise in areas where it could be detrimental to building operations (e.g. adjacent to occupied classrooms). If it is judged that normal contractor operations would create noise of a level that would be detrimental to these operations, that portion of the work should be performed outside the hours of building occupancy.

1.2.5 Dust Covers

Contractor shall provide temporary dust covers or protective enclosures to protect any furnishings, equipment or materials that are not required to be relocated during construction in any area. Covers or enclosures shall also be provided to protect existing construction that is to remain.

1.2.6 Furnishings and Equipment

In areas where furniture or equipment relocation that will not be performed by the user is required to perform the required work, Contractor shall relocate movable items away from the working area, protect the furniture or equipment, or replace items damaged. The areas that users will facilitate furniture relocation are identified elsewhere in these specifications. Items shall be relocated to their original position following the completion of the work. Leave attached items in place and protect them from damage, or temporarily disconnect, relocate, protect and reinstall them upon completion of the work. All items must be fully operational as certified by the appropriate authority upon completion of the work.

1.2.7 Conduct and Dress

Workers shall be properly attired at all times. Full length pants (no shorts), shirts (tee-shirt minimum), and proper shoes (no thongs, flip-flops or open toed sandals) are required. These criteria do not release Contractor responsibility from more stringent safety and dress criteria, however. Logos, slogans or other adornment of clothing that could be considered to be offensive to minors are prohibited. No smoking will be permitted in the buildings. Smoking will be permitted only in

designated outdoor areas. The contractor shall ensure that all lunch and breaktime debris are contained and removed from the project site at the end of each break or lunch period and disposed of properly. The contractor shall confine his personnel to the area within which the work is being performed. Profanity is strictly forbidden. The utmost courtesy shall be extended to the building occupants at all times. Conversation with occupants shall be limited to and pertain to the work at hand. All privately owned vehicles shall be parked in the contractor storage and staging area. Lights shall be turned off and doors and windows shall be locked after work in buildings following regular work hours.

1.2.8 Use of Building Facilities and Equipment

No items in the facility are to be used by the Contractor's personnel. Brooms, vacuums, cleaning supplies, telephones, restrooms, cafeteria facilities, vending machines, etc. shall not be used by the Contractor's personnel.

1.2.9 Restoration of Occupied Spaces

In the event that work has been performed in occupied spaces outside of regular work hours, the Contractor shall restore the space to its prior, occupiable and usable condition prior to conclusion of the days work. The space shall be available for use without restriction or interference the following day. All tools, supplies, materials, and equipment shall either be removed from the premises, or stored in such a manner as not to interfere with the facilities normal operations, subject to prior approval of the Contracting Officer. All dust and debris shall be removed from occupied spaces prior to the conclusion of work for the day.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

-- End of Section --

SECTION 01200
PROJECT MEETINGS
02/97
AM #0001

PART 1 - GENERAL

1.1 PRECONSTRUCTION CONFERENCE

Approximately three weeks after award of the contract and prior to the start of any construction work an authorized representative of the Contracting Officer will schedule and conduct a preconstruction conference.

The Contractor's Project Manager, Superintendent and his Quality Control Manager will attend this meeting. The Contractor is encouraged to have an officer of his company and representation from his sub-contractors at this conference. This conference will be held at the location specified by the Contracting Officer's authorized representative.

1.1.1 Start of Construction Work

If the Contractor has submitted the Accident Prevention (Safety) Plan, Quality Control Plan, and Environmental Protection Plan for review prior to this meeting, these may be accepted in toto or accepted with comments at the conference. Construction work will not proceed until after this meeting has been held, these three plans noted above have been accepted and the Notice to Proceed has been received and acknowledged by the Contractor.

1.2 PROGRESS MEETINGS

[AM #0001] Progress meetings to include the Contractor, the Contracting Officer and one representative of the school system shall be held weekly.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

-- End of Section --

SECTION 16711

FIBER OPTIC SYSTEM, OUTSIDE PLANT

05/98

AM #0001

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 2239 (1996a) Polyethylene (PE) Plastic Pipe
(SIDR-PR) Based on Controlled Inside
Diameter

ELECTRONIC INDUSTRIES ASSOCIATION (EIA)

EIA ANSI/EIA-455-81A (1992) FOTP-81 Compound Flow (Drip) Test
for Filled Fiber Optic Cable

EIA ANSI/EIA/TIA-455-30B (1991) FOTP-30 Frequency Domain
Measurement of Multimode Optical Fiber

EIA ANSI/EIA/TIA-455-53A (1990) FOTP-53 Attenuation by Substitution
Measurement for Multimode Graded-Index
Optical Fibers or Fiber Assemblies Used in
Long Length Communications Systems

EIA ANSI/EIA/TIA-455-78A (1990; R 1995) FOTP-78 Spectral
Attenuation Cutback Measurement for Single
Mode Optical Fibers

EIA ANSI/TIA/EIA-568A (1995) Commercial Building
Telecommunications Cabling Standard

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2 (1997) National Electrical Safety Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1996; Errata 96-4) National Electrical
Code

RURAL UTILITIES SERVICE (RUS)

RUS REA Bulletin 1751F-641 (1995) Construction of Buried Plant

RUS REA PE-33 (1985) Shield Bonding Connectors

RUS REA TE&CM 643-02 (1983) Underground Conduit and Manhole
Design and Construction (Physical Plant)

UNDERWRITERS LABORATORIES (UL)

UL 50

(1995; Rev thru Oct 1997) Enclosures for
Electrical Equipment

1.2 SYSTEM DESCRIPTION

The outside plant system shall consist of all cable, conduit, handholes, etc. required to provide signal paths as shown on the drawings, including, but not limited to, free standing frames or backboards, terminating cables, lightning and surge protection modules at the entry facility. The work consists of furnishing, installing, and testing a complete outside plant system [AM #0001] consisting of armored fiber optic cable placed inside of a 1 1/4" ID, PVC or HDPE duct for the entire length of the buried run. The final fiber counts shall provide for a total of 12 strands of fiber between each building.

1.3 QUALIFICATIONS

1.3.1 Cable Installers

Installation shall be under the direct supervision of an individual with a minimum of 3 years experience in the installation of the specified fiber optic cable and components.

1.3.2 Cable Splicing and Termination

All cable splicers shall have training in the proper techniques and have a minimum of 3 years experience in splicing and terminating the specified cables. Splices shall be performed by factory certified personnel or under direct supervision of factory trained personnel for products used.

1.3.3 Manufacturers

The cable, equipment, and hardware provided shall be from manufacturers that have a minimum of 3 years experience in producing the types of cable, equipment, and hardware specified.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Equipment List; GA

A data list of parts, tools, and test equipment for each different item of material and equipment specified prior to beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

SD-04 Drawings

Record Drawings; GA.

Record drawings for the installed wiring system showing the actual location of all cable terminations, splices, routing, and size and type of all cables. The identifier for each termination and cable shall appear on the drawings. The drawings shall include gauge and pair or fiber count for each cable, duct and innerduct arrangement, or conductor assignment of outside plant, and protector and connector block layout at the termination points after installation.

SD-06 Instructions

Installation; GA.

Printed copies of the manufacturer's recommendations for the material being installed, prior to installation. Installation of the item will not be allowed to proceed where installation procedures, or any part thereof, are required to be in accordance with those recommendations until the recommendations are received and approved.

SD-08 Statements

Acceptance Tests GA.

Test plans defining all tests required to ensure that the system meets specified requirements. The test plans shall define milestones for the tests, equipment, personnel, facilities, and supplies required. The test plans shall identify the capabilities and functions to be tested.

SD-09 Reports

Acceptance Tests; [GA].

Test reports in booklet form showing all field tests performed, upon completion and testing of the installed system. Measurements shall be tabulated on a pair by pair or strand by strand basis.

Qualifications; GA.

The qualifications of the manufacturer, splicer, and installation supervisor as specified.

1.5 DELIVERY AND STORAGE

1.5.1 Cable Requirements

All cable shall be shipped on reels. The diameter of the drum shall be large enough to prevent damage to the cable during reeling and unreeling. The reels shall be constructed to prevent damage during shipment and handling. The outer end of the cable shall be securely fastened to the reel head to prevent the cable from becoming loose in transit. The inner end of the cable shall project into a slot in the side of the reel, or into a housing on the inner slot of the drum, with sufficient length to make it available for testing. The inner end shall be fastened to prevent the cable from becoming loose during installation. End seals shall be applied to each of the cables to prevent moisture from entering the cable. The reels with cable shall be suitable for outside storage conditions when the temperature ranges from minus 40 to plus 65 degrees C, minus 40 to plus 148 degrees F, with relative humidity from 0 to 100 percent.

1.5.2 Equipment

All equipment shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or other contaminants, in accordance with the manufacturer's requirements.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of such products and shall be the manufacturer's latest standard design that has been in satisfactory use for at least 2 years prior to bid opening. Each major component of equipment shall have the manufacturer's name and type identified on the equipment. All products supplied shall be specifically designed and manufactured for use with outside plant communications systems. All items of the same class of equipment shall be the products of a single manufacturer.

2.2 GENERAL

Optical fibers shall be coated with a suitable material to preserve the intrinsic strength of the glass. The outside diameter of the glass-cladded fiber shall be nominally 125 microns, and shall be concentric with the fiber core. Optical fibers shall meet EIA ANSI/EIA/TIA-455-46A, EIA ANSI/EIA-455-65, and EIA ANSI/TIA/EIA-455-177A.

2.2.1 50 Micron Multimode Fibers

Conductors shall be multimode, graded index, solid glass waveguides with a nominal core diameter of 50 microns. The fiber shall have transmission windows centered at 850 and 1330 nanometer wavelengths. The numerical aperture for each fiber shall be a minimum of 0.20. The attenuation at 850 nanometers shall be 4.0 dB/Km or less. The attenuation at 1330 nanometers shall be 2.0 dB/Km or less. The minimum bandwidth shall be 400 MHz-Km at both transmission windows. The fibers shall be certified to meet EIA ANSI/EIA/TIA-455-30B and EIA ANSI/EIA/TIA-455-58A.

2.2.2 62.5 Micron Multimode Fibers

Conductors shall be multimode, graded index, solid glass waveguides with a nominal core diameter of 62.5 microns. The fiber shall have transmission windows centered at 850 and 1330 nanometer wavelengths. The numerical aperture for each fiber shall be a minimum of 0.275. The attenuation at 850 nanometers shall be 4.0 dB/Km or less. The attenuation at 1330 nanometers shall be 1.5 dB/Km or less. The minimum bandwidth shall be 160 MHz-Km at 850 nanometers and 400 MHz-Km at 1300 nanometers. FO cable shall be certified to meet EIA ANSI/EIA/TIA-455-30B and EIA ANSI/EIA/TIA-455-58A.

2.2.3 Single Mode Fibers

Conductors shall be single-mode, graded index, solid glass waveguides with a nominal core diameter of 8.3 microns. The fiber shall have a transmission window centered at [1330] [1550] nanometer wavelength. The numerical aperture for each optical fiber shall be a minimum of 0.10. The attenuation at 1330 nanometers shall be 0.5 dB/Km or less. The fibers shall be certified to meet EIA ANSI/EIA/TIA-455-170.

2.3 CABLE CONSTRUCTION

2.3.1 General

The cable shall contain a minimum of two fiber optic conductors for each full duplex circuit. The number of fibers in each cable shall be as shown on drawings. Each fiber shall be protected by a protective tube. Cables shall have a jacketed strength member, and an exterior jacket. Cable and fiber protective covering shall be free from holes, splits, blisters, and other imperfections. The covering shall be flame retardant, moisture resistant, non-nutrient to fungus, ultraviolet light resistant as specified and nontoxic. Mechanical stress present in cable shall not be transmitted to the optical fibers. Strength members shall be non-metallic and shall be an integral part of the cable construction. The combined strength of all the strength members shall be sufficient to support the stress of installation and to protect the cable in service. The exterior cables shall have a minimum storage temperature range of minus 20 to plus 75 degrees C. minus 40 to plus 167 degrees F. Interior cables shall have a minimum storage temperature of minus 10 to plus 75 degrees plus 14 to plus 167 degrees F. All cables furnished shall meet the requirement of NFPA 70.

Fire resistant characteristics of cables shall conform to Article 770, Sections 49, 50, and 51. A flooding compound shall be applied into the interior of the fiber tubes, into the interstitial spaces between the tubes, to the core covering, and between the core covering and jacket of all cable to be installed aerially, underground, and in locations susceptible to moisture. Flooded cables shall comply with EIA ANSI/EIA-455-81A and EIA ANSI/EIA/TIA-455-82B. Cables shall be from the same manufacturer, of the same cable type, and of the same size. Each fiber and protective coverings shall be continuous with no factory splices.

Fiber optic cable assemblies, including jacketing and fibers, shall be certified by the manufacturer to have a minimum life of 30 years. Plenum cable shall meet UL 910, and riser cable shall meet UL 1666. FO cable shall be certified to meet the following: EIA ANSI/TIA/EIA-455-13A, EIA ANSI/EIA/TIA-455-25B, EIA ANSI/TIA/EIA-455-41A, EIA ANSI/EIA/TIA-455-47B, EIA ANSI/EIA/TIA-455-59, EIA ANSI/EIA/TIA-455-61, EIA ANSI/EIA-455-88, EIA ANSI/EIA-455-91, EIA ANSI/TIA/EIA-455-104A, and EIA ANSI/EIA-455-171.

2.3.1.1 Duct Cable

The optical fibers shall be surrounded by a tube buffer, shall be contained in a channel or otherwise loosely packaged to provide clearance between the fibers and inside of the container, and shall be extruded from a material having a coefficient of friction sufficiently low to allow the fiber free movement.

- a. Tensile strength: Cables shall withstand an installation tensile load of not less than 2700 Newtons 608 pounds and not less than 600 Newtons 135 pounds continuous tensile load.
- b. Impact and Crush resistance: The cables shall withstand an impact of 3 Newton-meters 1.7lbs/in as a minimum, and shall have a crush resistance of 220 Newtons per square centimeter 317 pounds per square inch as a minimum.

2.3.2 Interior Cable

- a. Loose buffer tube cable construction shall be such that the optical fibers shall be surrounded by a tube buffer, shall be contained in a channel or otherwise loosely packaged to provide clearance between the fibers and the inside of the container to allow for thermal expansions without constraining the fiber. The protective

container shall be extruded from a material having a coefficient of friction sufficiently low to allow the fiber free movement.

(1) Tensile strength: Cables of 12 fibers or less shall withstand an installation tensile load of not less than 1,100 Newtons 250 pounds and not less than 89 Newtons 20 pounds continuous tensile load. Cables with more than 12 fibers shall withstand an installation load of not less than 530 Newtons 20 pounds and a long term tensile load of not less than 53 Newtons. 12 pounds.

(2) Impact and Crush resistance: The cables shall withstand an impact of 4.89 Newton-meters 1.1 ft lbs as minimum, and shall have a crush resistance of 700 Newtons per square centimeter 400 lbs/in. as a minimum.

- b. Tight buffer tube cable construction shall be extrusion of plastic over each clad fiber, with an outer jacket of flame retardant PVC or FCP, which complies with NFPA 70 for OFNR requirements for riser cables and vertical shaft installations. Optical fibers shall be covered in near contact with an extrusion tube and shall have an intermediate soft buffer to allow for the thermal expansions and minor pressures.

(1) Tensile Strength: Cables of 12 fibers or less shall withstand an insulation tensile load of not less than 845 Newtons 190 pounds and not less than 222 Newtons 50 pounds continuous tensile load. Cables with more than 12 fibers shall withstand an installation load of not less than 667 Newtons 150 pounds and a long term tensile load of not less than 133 Newtons 30 pounds.

(2) Impact and Crush resistance: The cables shall withstand an impact of 1.8 Newton-meters 1.4 ft-lbs as a minimum, and shall have a crush resistance of 140 Newtons per square centimeter 80 lbs/in. as a minimum.

- c. Cables shall have a plenum rated jacket and meet the requirements of UL 910.

2.3.3 Pigtail Cables

Cable used for connections to equipment shall be flexible fiber pigtail cables having the same physical and operational characteristics as the parent cable. The cable jacket shall be flame retardant PVC or FCP, which complies with NFPA 70 for OFNP applications. Maximum dB loss for pigtail cable shall be .70 dB/km at 850 nanometers, and .70 dB/km at 1330 nanometers.

2.4 FO CONNECTORS

FO connectors shall be the straight tip, bayonet style, field installable, self-aligning and centering. FO connectors shall match the fiber core and cladding diameters. The connector coupler shall be stainless steel and the alignment ferrule shall be ceramic. FO equipment and cable shall use the same type connectors. Connector insertion loss shall be nominally 0.30 dB and less than 0.70 dB.

2.5 MECHANICAL SPLICES

Mechanical splices shall be suitable for installation in the field.

External power sources shall not be required to complete a splice. Splices shall be self-aligning for optimum signal coupling. Mechanical splices shall not be used for exterior applications where they may be buried underground or laced to aerial messenger cables. Mechanical splices may be used for interior locations and within enclosures. Splice closures shall protect the spliced fibers from moisture and shall prevent physical damage.

The splice closure shall provide strain relief for the cable and the fibers at the splice points.

2.5.1 Interior Work

All interior cables shall be contained in plenum rated innerduct. Cable installation and applications shall meet the requirements of NFPA 70, Article 770, Sections 52 and 53. Cables shall be properly secured and neat in appearance.

2.5.2 Exterior Underground Cable

- a. Minimum burial depth for cable shall be 1300 millimeters, (48 inches), but not less than the depth of the frost line. Burial depth specified shall take precedence over any requirements specified elsewhere.
- b. Where duct will pass under sidewalks, roads, or other paved areas and no existing conduits or duct banks are available, the duct shall be placed in a properly sized PVC sleeve.
- c. Cables shall be placed below a plastic warning tape buried in the same trench or slot. The tape shall be 450 millimeters 18 inches above the cable. The warning tape shall be continuously imprinted with the words "WARNING - COMMUNICATIONS CABLE BELOW" at not more than 1300 millimeters 48 inch intervals. The plastic tape shall be acid and alkali resistant polyethylene film, 76.2 millimeters 3 inches wide with a minimum thickness of 0.1 millimeter 0.004 inch. Tape shall have a minimum strength of 12066 kilo Pascals 1750 pounds per square inch lengthwise and 10342 kilo Pascals 1500 pounds per square inch crosswise.
- e. A cable lubricant compatible with the cable sheathing material shall be used on all cables pulled. Pulling fixtures shall be attached to the cable strength members. If indirect attachments are used, the grip diameter and length shall be matched to the cable diameter and characteristics. If an indirect attachment is used on cables having only central strength members, the pulling forces shall be reduced to ensure that the fibers are not damaged from forces being transmitted to the strength member. During pulling the cable pull line tension shall be continuously monitored using dynamometers or load-cell instruments, and shall not exceed the maximum tension specified by the cable manufacturer. The mechanical stress placed upon the cable during installation shall be such that the cable is not twisted or stretched. A cable feeder guide shall be used between the cable reel and the face of the duct or conduit to protect the cable and guide it into the duct or conduit as it is unspooled from the reel. As the cable is unspooled from the reel, it shall be inspected for jacket defects or damage. The cable shall not be kinked or crushed and the minimum bend radius of the cable shall not be exceeded during installation. Cable shall be hand fed and

guided through each handhole and additional lubricant shall be applied at all intermediate handholes. When practicable, the center pulling technique shall be used to lower pulling tension. That is, the cable shall be pulled from the center point of the cable run towards the end termination points. The method may require the cable to be pulled in successive pulls. If the cable is pulled out of a junction box or handhole the cable shall be protected from dirt and moisture by laying the cable on a ground covering.

2.5.3 Service Loops

Each fiber optic cable shall have service loops of not less than 9.8 feet in length at each end. The service loops shall be housed in a service loop enclosure.

2.5.4 Metallic Sheath Grounding

Fiber optic cable with metallic sheath shall have the metallic sheath grounded at the cable splice points, located at building entrances.

2.5.5 Splices

No splices will be permitted unless the length of cable being installed exceeds the maximum standard cable length available from a manufacturer. Splices shall be made using the method recommended by the cable manufacturer. Splices shall be housed in a fire resistant splice enclosure and shall be protected against infiltration of moisture or contaminants. FO splices shall be field tested at the time of splicing.

Mechanical splices shall have less than 0.5 dB loss. There shall be no more than 1 splice per kilometer 0.62 mile in any of the FO cables excluding terminations. Field splices shall be located in cable boxes. Sufficient cable shall be provided in each splicing location to properly rack and splice the cables, and to provide extra cable for additional splices. Cable ends shall be protected with end caps except during actual splicing. During the splicing operations, means shall be provided to protect the unspliced portions of the cable and its fibers from the intrusion of moisture and other foreign matter.

2.5.6 Identification and Labeling

Identification tags or labels shall be provided for each cable. Markers, tags and labels shall use indelible ink or etching which will not fade in sunlight, or in buried or underground applications. Markers, tags, and labels shall not become brittle or deteriorate for a period of 20 years. Label all termination blocks and panels with cable number or pair identifier for cables in accordance with EIA ANSI/TIA/EIA-606 and as specified. The labeling format shall be identified and a complete record shall be provided to the Government with the final documentation. Each cable shall be identified with type of signal being carried and termination points.

2.5.7 Enclosure Sizing and Cable

Termination enclosures shall be sized to accommodate the FO equipment to be installed. Sizing shall include sufficient space for service loops to be provided and to accommodate a neat, workmanlike layout of equipment and the

bend radii of fibers and cables terminated inside the enclosure.

2.5.8 Enclosure Penetrations

Enclosure penetrations shall be from the bottom and shall be sealed with rubber silicone sealant to preclude the entry of water. Conduits rising from underground shall be internally sealed.

2.6 CABLE SPLICES AND ORGANIZERS

2.6.1 Fiber Optic Cable Splices

Each fiber optic splice shall be physically protected by a splice kit. The kit shall be specially designed for the splice. All exterior grade cables shall be spliced into plenum rated cables, within 10 feet of building entrance.

2.6.2 Fiber Optic Splice Organizer

The splice organizer shall be suitable for housing fiber optic splices in a neat and orderly fashion. The splice organizer shall allow for a minimum of 3 feet of fiber for each fiber within the cable to be neatly stored without kinks or twists. The splice organizer shall accommodate individual strain relief for each splice. The splice organizer shall allow for future maintenance or modification, without damage to the cable or splices. All required splice organizer hardware, such as splice trays, protective glass shelves, and shield bond connectors shall be provided in the organizer kit.

2.7 HANDHOLES

All handhole and duct products shall conform to RUS REA TE&CM 643-02.

Manholes, handholes, and pullboxes shall be as indicated. Strength of manholes, handholes, and pullboxes and their frames and covers shall conform to the requirements of IEEE C2. Handholes for low voltage cables installed in parking lots, sidewalks, and turfed areas shall be fabricated from an aggregate consisting of sand and with continuous woven glass strands having an overall compressive strength of at least and a flexural strength of at least. Pullbox and handhole covers in sidewalks, and turfed areas shall be of the same material as the box.

2.8 DRIVEN GROUND RODS

Ground rods shall be copper-clad steel conforming to UL 467 not less than in diameter by in length. Sectional type rods may be used.

2.9 INTERIOR INNERDUCT

Innerduct shall be SIDR 11.5 polyethylene plastic pipe conforming to ASTM D 2239. All innerduct shall be plenum rated.

2.10 CONDUIT AND EXTERIOR DUCTS

Ducts shall be single, round-bore type, with wall thickness and fittings suitable for the application. Duct lines shall be nonencased direct-burial, thick-wall type.

2.10.1 Metallic Conduit

Intermediate metal conduit shall comply with UL 1242. Rigid galvanized steel conduit shall comply with UL 6 and ANSI C80.1. Metallic conduit fittings and outlets shall comply with UL 514A and NEMA FB 1.

2.10.2 Conduit Sealing Compound

Compounds for sealing ducts and conduit shall have a putty-like consistency workable with the hands at temperatures as low as 35 degrees F, shall neither slump at a temperature of 300 degrees F, nor harden materially when exposed to the air. Compounds shall adhere to clean surfaces of fiber or plastic ducts; metallic conduits or conduit coatings; concrete, masonry, or lead; any cable sheaths, jackets, covers, or insulation materials; and the common metals. Compounds shall form a seal without dissolving, noticeably changing characteristics, or removing any of the ingredients. Compounds shall have no injurious effect upon the hands of workmen or upon materials.

2.11 EQUIPMENT RACKS

Distribution frames, cabinets, and back-boards shall be provided as shown and designed to mount connector blocks, protector blocks, cross connects, and other hardware required to terminate and protect the outside plant cable; to provide a demarcation point between inside and outside plant cable; and to allow inside and outside plant cable to be cross connected.

2.11.1 Floor Mounted Open Frame

Floor mounted equipment racks shall be single sided aluminum relay racks with uprights to mount equipment 480 mm (19 inches) wide. Uprights shall be 75 mm (3 inch) deep channel, 32 mm (1-1/4 inch) wide, drilled and tapped 12-24 in a 13 mm (1/2 inch) pattern. Racks shall be provided with a standard top cross-member, and predrilled base plate to allow floor fastening. Open frame equipment racks shall be 2.1 m (7 feet) in height and painted black.

2.11.2 Wall Mounted Open Frame

Wall mounted open frame equipment racks shall be aluminum relay racks to mount equipment 480 mm (19 inches) wide with standoff brackets for wall mounting. Uprights shall be drilled and tapped 12-24 in a 13 mm (1/2 inch) pattern. Standoff brackets shall be of sufficient length for a 150 mm (6 inch) clearance between rack and wall. Wall mounted open frame racks shall be hinged.

2.11.3 Cable Guides

Cable guides shall be specifically manufactured for the purpose of routing cables, wires and patch cords horizontally and vertically on 480 mm (19 inch) equipment racks. Cable guides shall consist of ring or bracket-like devices mounted on rack panels for horizontal use or individually mounted for vertical use. Cable guides shall mount to racks by screws and/or nuts and lock-washers.

2.11.4 Floor Mounted Cabinets

Equipment cabinets shall be floor mounted enclosures with side panels, acrylic plastic front doors, rear louvered metal doors, depth-adjustable front and rear mounting rails, and louvered top. Ventilation fans shall be

included. Vertical cable management devices shall be integral to the cabinet. Power strips with 6 outlets shall be mounted within the cabinet. Equipment racks shall mount equipment 480 mm (19 inches) wide and shall be 1828 mm (72 inches) high and 760 mm (30 inches) deep. Cabinet exteriors shall be painted black. All cabinets shall be lockable front and back.

2.11.5 Wall Mounted Cabinets

Wall mounted cabinets shall conform to UL 50 and have boxes constructed of zinc-coated sheet steel with dimensions not less than shown on drawings. Trim shall be fitted with hinged door and flush catch. Cabinets shall be hinged on both the front and the back of the cabinet. Doors shall provide maximum openings to the box interiors. Locks shall be provided for both front and back doors.

2.11.6 Equipment Mounting Backboard

Backboards shall be 19 mm (3/4 inch) AC plywood, sized as shown, painted with white or light colored paint.

2.12 FIBER-OPTIC TERMINATIONS

2.12.1 Fiber Optic Connectors

All outside plant fiber strands shall be terminated in a ST type fiber optic connector, with ceramic ferrule material and a maximum insertion loss of 0.5 dB. Connectors shall meet performance standards of EIA ANSI/TIA/EIA-568A. If pre-connectorized cable assemblies or pigtails are used, the connectors shall be terminated on a 3 m (10 foot) length of single-fiber cable. The single-fiber cable shall contain a buffered optical fiber of the same type and specification as that used in the multi-fiber cable.

2.12.2 Fiber Optic Patch Panels

Patch panels shall be a complete system of components by a single manufacturer, and shall provide termination, splice storage, routing, radius limiting, cable fastening, storage, and cross-connection. Patch panels shall be 480 millimeters (19 inch) rack mounted panels. Patch panels shall provide strain relief for cables. Panels shall be provided with labeling space. Patch panel connectors and couplers shall be the same type and configuration as used elsewhere in the system.

2.13 MISCELLANEOUS ITEMS

2.13.1 Shield Connectors

Shield connectors shall make a stable, low-impedance electrical connection between the shield of the communications cable and a conductor such as a strap, bar, or wire. The connector shall be made of tin-plated tempered brass. Shield bond connectors shall comply with RUS REA PE-33.

2.13.2 Patch Cords

Patch cords shall be cable assemblies consisting of flexible optical fiber cable with ST connectors on one end and SC connectors on the other end. Optical fiber shall be the same type as used elsewhere in the system. Patch cords shall be complete assemblies from manufacture's standard products.

2.13.3 Cable Warning Signs

Cable warning signs, which identify the route of buried cable, shall be stake mounted. The stake shall be driven into undisturbed soil and the sign shall be mounted to the stake in accordance with the manufacturer's instructions. Warning signs shall be placed at intervals of no more than 152.5 m (500 feet) and at each change of direction in the cable route. Warning signs shall also be placed on each side of every crossing of surface obstacles such as roads, railroads, stream crossings, or any similar crossing where excavation is likely to occur.

PART 3 EXECUTION

3.1 INSTALLATION

All system components and appurtenances shall be installed in accordance with the manufacturer's instructions and as shown. All installation work shall be done in accordance with the safety requirements set forth in the general requirements of IEEE C2 and NFPA 70.

Except as covered herein, excavation, trenching, and backfilling shall conform to the requirements of Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

3.1.1 Conformance to Codes

The installation shall comply with the requirements and recommendations of NFPA 70 and IEEE C2 as applicable.

3.1.2 Verification of Dimensions

The Contractor shall become familiar with details of the work, shall verify dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing any work.

3.1.3 Cable Inspection and Repair

All cable and wire used in the construction of the project shall be handled with care. Each reel shall be inspected for cuts, nicks or other damage. All damage shall be repaired to the satisfaction of the Contracting Officer. The reel wrap shall remain intact on the reel until the cable or wire is ready to be placed.

3.1.3.1 Cable Depth

Ducts shall be at a minimum depth of 1.2M (48 inches) A warning tape shall be placed (18 inches) above the cable and approximately (30 inches) below ground level.

3.1.3.2 Above Ground Cable Protection

Cable installed on the outside of buildings, less than 2.5 m 8 feet above finished grade, shall be protected against physical damage.

3.1.3.3 Cable Bends

Cable bends shall have a radius of not less than 10 times the cable diameter.

3.1.3.4 Penetrations

Penetrations in walls, ceilings or other parts of the building, made to provide for cable access, shall be caulked and sealed. Where conduits and ducts pass through fire walls, fire partitions, above grade floors, and fire rated chase walls, the penetration shall be sealed with fire stopping materials as specified in Section 07270 FIRESTOPPING. Fire stopped penetrations shall not compromise the fire rating of the walls or floors. All underground building entries shall be through waterproof facilities.

3.1.3.5 Backfill for Rocky Soil

When placing cable in a trench in rocky soil, the cable shall be cushioned by a fill of sand or selected soil at least 50 mm (2 inches) thick on the floor of the trench before placing the cable or wire. The backfill for at least 100 mm (4 inches) above the wire or cable shall be free from stones, rocks, or other hard or sharp materials which might damage the cable or wire.

3.1.4 Duct Cleaning

After installation of duct, and prior to pulling in cable, all duct assembly shall be cleared and cleaned according to manufacturers recommendations.

3.1.4.1 Duct Lubrication

The cable lubricant shall be compatible with the cable jacket for cable that is being installed. Application of lubricant shall be in accordance with lubricant manufacturer's recommendations.

3.1.5

3.1.6 Underground Cable

Underground cable installation shall be accomplished in accordance with the requirements set forth in RUS REA Bulletin 1751F-641.

3.1.6.1

3.1.6.2 Cable Pulling

For cable installed in ducts and conduit, a cable feeder guide shall be used, between the cable reel and the face of the duct and conduit, to protect the cable and guide it into the duct and conduit as it is paid off the reel. As the cable is paid off the reel, it shall be inspected for jacket defects. Precautions shall be taken during installation to prevent the cable from being kinked or crushed. A pulling eye shall be attached to the cable and used to pull the cable through the duct and conduit system. Cable shall be hand fed and guided through each handhole. As the cable is paid off the reel into the cable feeder guide, it shall be sufficiently lubricated with a type of lubricant recommended by the cable manufacturer. Where the cable is pulled through a handhole, additional lubricant shall be applied at all intermediate handholes. Dynamometers or load-tension instruments shall be used to ensure that the pulling line tension does not exceed the installation tension value specified by the cable manufacturer. The mechanical stress placed upon a cable during installation shall not cause the cable to be twisted or stretched.

3.1.6.3 Cable Bends

Telephone cable bends shall have a radius of not less than 10 times the cable diameter. Only large radius sweeps shall be used in conduit runs and shall not exceed a cumulative 90 degrees between handholes.

3.1.6.4 Pull Cord

Pull cords of 10 mm (3/8 inch) polypropylene shall be installed in all unused ducts and inner-ducts with a minimum of 610 mm (2 feet) spare cord protruding from each end.

3.2 SPLICING

3.2.1 Fiber Optic Splices

Fiber optic splicing shall be in accordance with the manufacturer's recommendation.

3.3 DUCT LINES

3.3.1 Treatment

Ducts shall be kept clean of concrete, dirt, or foreign substances during construction. Field cuts requiring tapers shall be made with proper tools and match factory tapers. A coupling recommended by the duct manufacturer shall be used whenever an existing duct is connected to a duct of different material or shape.

3.3.1.1 Installation of Couplings

Joints in each type of duct shall be made up in accordance with the manufacturer's recommendations for the particular type of duct and coupling selected and as approved.

3.3.1.2 Plastic Duct

Duct joints shall be made by brushing a plastic solvent cement on insides of plastic coupling fittings and on outsides of duct ends. Each duct and fitting shall then be slipped together with a quick 1/4-turn twist to set the joint tightly.

3.3.2 Handholes

Handholes shall be located approximately as shown. Handholes shall be of the type noted on the drawings and shall be constructed in accordance with the details shown.

3.4 GROUNDING

Except where specifically indicated otherwise, all exposed non-current carrying metallic parts of telephone equipment, cable sheaths, cable splices, and terminals shall be grounded. Grounding shall be in accordance with requirements of NFPA 70, Articles 800-33 and 800-40.

Cable shields, cable sheaths and armor, and metallic conduit shall be grounded upon building entry.

3.4.1 Grounding and Bonding Connections

Connections above grade shall be made by the fusion-welding process or with bolted solderless connectors, in compliance with UL 467, and those below grade shall be made by a fusion-welding process. Where grounding conductors are connected to aluminum-composition conductors, specially treated or lined copper-to-aluminum connectors suitable for this purpose shall be used.

3.4.2 Grounding and Bonding Conductors

Grounding and bonding conductors include conductors used to bond transformer enclosures and equipment frames to the grounding electrode system. Grounding and bonding conductors shall be sized as shown, and located to provide maximum physical protection. Bends greater than 45 degrees in ground conductors are not permitted. Routing of ground conductors through concrete shall be avoided. When concrete penetration is necessary, nonmetallic conduit shall be cast flush with the points of concrete entrance and exit so as to provide an opening for the ground conductor, and the opening shall be sealed with a suitable compound after installation.

3.4.3 Incoming Outside Plant Cables

All incoming outside plant cable shields shall be ground from the splice case.

PART 4 ACCEPTANCE TESTS

The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all required testing. Notification of any planned testing shall be given to the Contracting Officer at least 14 days prior to any test; testing shall not proceed until after the Contractor has received written Contracting Officer's approval of the test plans as specified. The test plans shall define all the tests required to ensure that the system meets technical, operational, and performance specifications. The test plans shall define milestones for the tests, equipment, personnel, facilities, and supplies required. The test plans shall identify the capabilities and functions to be tested.

4.1 Fiber Optic Cable

Two optical tests shall be performed on all optical fibers: Optical Time Domain Reflectometry (OTDR) Test, and Attenuation Test. In addition, a Bandwidth Test shall be performed on all multi-mode optical fibers. These tests shall be performed on the completed end-to-end spans which include the near-end pre-connectorized single fiber cable assembly, outside plant as specified, and the far-end pre-connectorized single fiber cable assembly.

4.1.1 OTDR Test

The OTDR test shall be used to determine the adequacy of the cable installations by showing any irregularities, such as discontinuities, micro-bendings, improper splices, for the cable span under test. Hard copy fiber signature records shall be obtained from the OTDR for each fiber in each span and shall be included in the test results. The OTDR test shall be measured in both directions. A reference length of fiber, (3280 feet) minimum, used as the delay line shall be placed before the new end

connector and after the far end patch panel connectors for inspection of connector signature. The OTDR test shall be conducted in accordance with EIA ANSI/EIA-455-81A for single-mode fiber and EIA ANSI/EIA/TIA-455-78A for multi-mode fiber.

4.1.1.1.1 Attenuation Test

End-to-end attenuation measurements shall be made on all fibers, in both directions, using a 1300 nanometer light source at one end and the optical power meter on the other end to verify that the cable system attenuation requirements are met. The measurement method shall be in accordance with EIA ANSI/EIA/TIA-455-53A.

4.1.1.1.2 Bandwidth Test

The end-to-end bandwidth of all multi-mode fiber span links shall be measured by the frequency domain method. The bandwidth shall be measured in both directions on all fibers. The bandwidth measurements shall be in accordance with EIA ANSI/EIA/TIA-455-30B.

-- End of Section --